# Policy design of cayenne pepper supply chain development

*by* Muhammad Arsyad

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## Abstract

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Production and harvest area of cayenne pepper in Indonesia in 2015 were 869 938 tons and 134 869 ha, respectively. This caused Indonesia to be ranked first as the country with the largest chili and green pepper harvest area in ASEAN with an average contribution of 96.22%. The price of cayenne fluctuated very sharply with a very large margin. The highest prices that occur at the farmer and retailer level were $ US 4.48/kg and $ US 7.24/kg respectively in March 2017, while the lowest price was $ US 1.03/kg at farmer level and $ US 2.07/kg at retail level in December 2017. Purpose of the study was reviewing supplier performance and designing cayenne supply chain development policies. The research method used survey data which was obtained from farmers, chili traders and related agencies. Data analysis utilized Process Hierarchy Analysis (AHP). The results of the study showed the price factor has the highest value because the price of cayenne in Gorontalo Province was very fluctuating following the market mechanism. The policy recommendation for developing the cayenne supply chain which has the highest value and the first priority was the policy of determining the government's purchase price.

*Keywords:* chain; supply; design; policy; price

## Introduction

Cayenne pepper is one of the most sought-after and important commodities in the community, because it is used by the community as sambal, cooking spices, and vegetables every day. Aside from being a complementary ingredient of every dish, cayenne pepper is also often a processed product such as bottled chili, chili powder, drinks and medicines (Astuti, 2016; Tubagus et al., 2016).

Gorontalo was included in the center of cayenne production in Sulawesi Island with a harvest area of 1928 ha, production of 11 942 tons and productivity of 6.19 tons /ha in 2016 (BPS Gorontalo, 2017). Gorontalo people are very fanatical about fresh cayenne pepper and generally cannot be replaced by processed products. Cayenne pepper is a superior commodity where the LQ value is 1.15-1.83 meaning that the chili production in the area is a surplus of 1.15-1.83 times greater than its own needs (Nurdin et al., 2011). Therefore, marketing of cayenne in the Gorontalo market is also sent outside the region.

Cayenne like other agricultural commodities have characteristics such as: (1) perishable products, (2) cultivation and harvesting are very dependent on climate and season, (3) quality varies and (4) camba or bulky (5) more susceptible to attack pests and diseases and (6) Functioning as social products (Natsir et al., 2018; Rahim & Hastuti, 2007; Darma, 2017). In addition, erratic extreme weather that occurs can have implications for the uncertainty of the amount of production that will affect the supply of cayenne pepper (Potolau et al., 2013). If the supply of cayenne is lower than the demand, a price increase will occur. Conversely, if the supply of cayenne surpasses the demand, the price will de-

crease (Natsir et al., 2018). In certain seasons such as holidays, Christmas and New Year, the increase in the price of cayenne is quite significant so that it affects the inflation rate (Astuti, 2016; Saptana et al., 2012).

The supply of cayenne per month at the level of farmers in Gorontalo is uncertain so the price formed also changes. In 2017, there was a significant increase in the price of cayenne in March from $ US 4.48/kg to $ US 7.24/kg respectively at the level of farmers and retailers. Otherwise, it decreased in December from $ US 1.03/kg to $ US 2.07/kg. Price differences between farmers and retailers indicate that the higher the price of cayenne, the marketing margin will increase, and conversely the lower the price of cayenne, the smaller the marketing margin. The high fluctuations in chili prices have not been a concern of the government as well as corn and soybeans, causing the price of cayenne pepper to fluctuate in the market due to the price mechanism being fully handed over to the market.

The level of efficiency of supply chain performance is measured by the cost approach (Dilana, 2013; Kurniawan et al., 2014), performance of flexibility, responsiveness, quality, productivity and accessibility to measure supply chain resilience (Rajagopal, 2016). Evaluation of chain patterns and analysis of supply chain downstream material flow to meet logistical needs of the market (Tubagus et al., 2016; Ongirwalu et al., 2015; Courtonne et al. 2015); price fluctuations (Djurics & Gotz, 2016); value chains and fruit distribution channels (Gjokaj et al., 2017) and beef supply chain models (Mesco) (Pizutti et al., 2017). Supply chains in the agriculture sector is more in export commodities such as coffee, cocoa beans, or better yields such as shrimp (Asir et al., 2019; Noviantari et al., 2015; Untsayain et al., 2017). Supply chains in horticultural commodities such as cayenne which are still very various findings, it can be seen that the design of the cayenne supply chain development policy has not been explained.

Supply chains are one approach that is believed to be able to be used to resolve cayenne commodity problems such as: unpredictable chili supply, price fluctuations, uncertainty in production, extreme weather, lengthof distribution channels, transportation, and price stabilization. In addition, the chili commodity supply chain approach is expected to provide an overview of the availability of cayenne as a consideration for managing the supply chain for consumers and agro-industries. The research objective is to design a cayenne supply chain development policy in Gorontalo Province.

## Methods

The research method utilized the survey method. Sampling of farmers used the area (cluster) sampling technique.

While the sampling of traders using the snowball sampling technique was sampling taken following the marketing flow through the producer farmers to the final consumer. The taking of experts used purposive sampling technique namely extension agent and head of Gorontalo Province Agriculture Service. The data used primary data and secondary data of this study. Primary data was obtained from the results of observations and direct interviews with farmers, traders, extension agents and the head of the Agriculture Service. While secondary data was obtained from BPS (Central Bureau of Statistics) and related to agencies. This research was conducted in a year (July 2017 - July 2018) in Gorontalo Province. Data analysis utilized Analytical Hierarchy Process (AHP). AHP's working principle is to break complex and unstructured situations into its component parts, then organize parts or variables into a hierarchy. Furthermore, giving numerical values to subjective considerations of the relative importance of a variable, and synthesizing these various considerations to determine which variables have the highest priority (Firdaus & Farid, 2008). Assessment results are processed using Expert Choice software 11.

## Results and Discussion

The designs of the cayenne supply chain development policy in Gorontalo consist of level 1, namely the goal or target, level 2: criteria or factors, level 3: problems or sub-factors and level 4: alternative policies. This can be seen in Figure 1.

### *Identification of Chili pepper Supply Chain Criteria*
The results of the identification of criteria for developing cayenne pepper supply chain in Gorontalo using AHP (Analysis Hierarchy Process) analysis can be seen in Figure 2.

Figure 2 shows the price factor being the highest priority, while the risk factor is the lowest priority. Factors that cause prices to be the first priority because of the characteristics of cayenne in Gorontalo are very fluctuating from the range of $ US 0.69 – 20 per kg. This is due to the need of Gorontalo people for fresh cayenne pepper which is very high compared to other regions. The consumption level of Gorontalo chili is 5.7 kg per capita, higher than national consumption, which is 2.5 kg per capita. In addition, the price increase in Gorontalo always follows price increases outside the region even though the surplus production (Gorontalo needs 5500 tons while its production is 11000 tons). This is due to the high demand for Gorontalo cayenne from outside the region because it has advantages such as: a long shelf life, and a higher degree of spiciness than other regions. This is related to Farid & Subekti (2012)
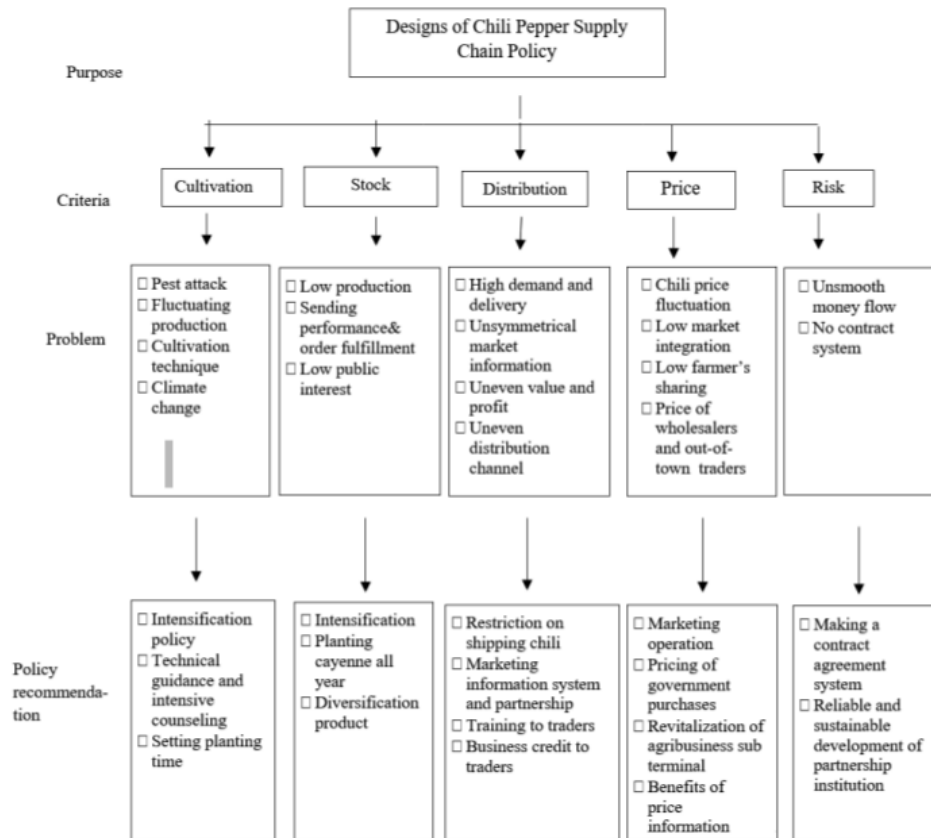
**Fig. 1. Hierarchy structure design of raw chili supply chain development policy in Gorontalo**
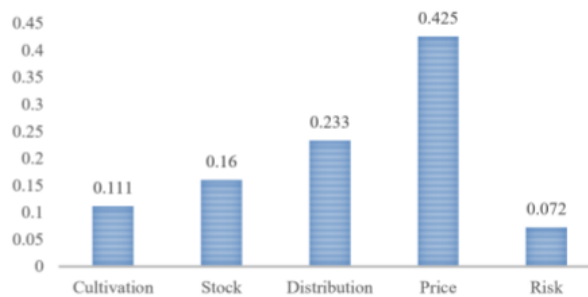


**Fig. 2. Weight of chili raw supply chain criteria in Gorontalo**

that cayenne was inelastic towards price changes. The factors that influence the price of cayenne were the factors of production, production costs, distribution channels and consumption factors.

*Identification of chili pepper supply chain problems*
The results of the identification of the problem of developing cayenne supply chains in Gorontalo using the AHP (Analysis Hierarchy Process) analysis can be seen in Figure 3.

Based on AHP analysis, cultivation of cayenne which is not recommended has the greatest weight on the Cultivation criteria, while fluctuating production has the lowest weight. Cayenne farmers in Gorontalo in general have not followed the recommended cultivation techniques. In selecting seed varieties, farmers prefer to plant cayenne varieties that have a short production process, namely Sirop, Nirmala and Dewata varieties having a production period only 3 - 4 months. This variety generally produces fruit with small stems, and not so good. In addition, harvests can only be done 2-3 times, after which farmers must replace them with new seeds. Most farmers in Gorontalo do not use fertilizers and medicines in the cultivation of cayenne because they are expensive. Some farmers state they are chasing high prices for cayenne, they are harvesting prematurely, so many of the commodities sold
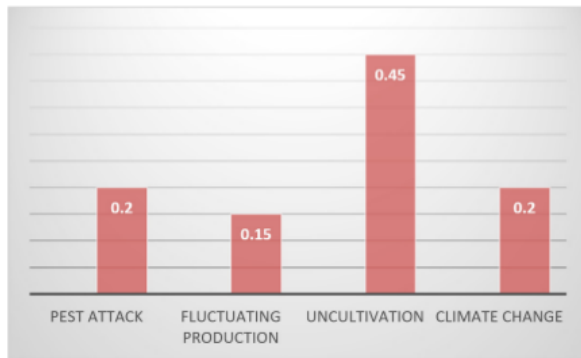
**Fig. 3. Value of problems in chili rawfish chain development cultivation**

in the market are not yet ripe. Regarding with BPTP (2016), the main problem of chili agribusiness is caused by lack of mastery of technology (nursery technology, cultivation, and harvest and post-harvest handling), chili farming systems that are still sporadic resulting in scattered production with diverse quality, weak coordination among agribusiness actors which causes the structure of the agribusiness network to be less robust. Whereas in the Inventory criteria, product flow problems that are in accordance with availability have the highest weight, while the problem of surplus cayenne production is the lowest priority. This can be seen in Figure 4.

The production of fresh cayenne in Gorontalo is smaller than the number of requests, whereby the sale of cayenne depends on the amount of supply available to farmers and traders, not from demand from outside traders because the amount of demand is not in accordance with the existing supply. If the availability of chili is greater than the number of requests from outside the city, the price of cayenne will
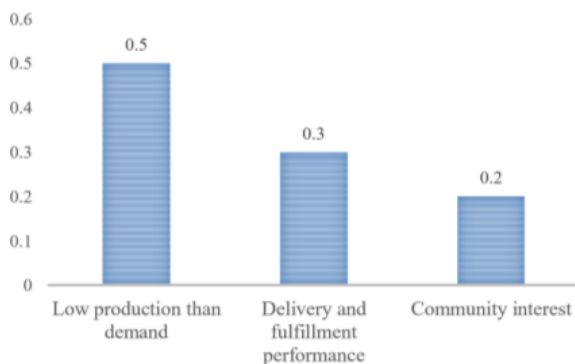
drop, whereas the supply of cayenne is a little, the price of cayenne will increase. In addition, the consumption of high fresh cayenne pepper has caused public interest in the yield of chili peppers to be low.

The amount of cayenne pepper supply depends on the cultivation of cayenne pepper. Planting of cayenne pepper in Gorontalo is spread throughout the district. The climate greatly affects the cultivation of cayenne in Gorontalo, including those that cause attacks on pests and diseases as well as the changing yields of cayenne pepper. Gorontalo's relatively dry climate and high solar radiation and rainfall that is not too high compared to Makassar or Manado which causes the commodity of Gorontalo cayenne to have the advantage of being more resistant and more spicy. However, with little rainfall, cayenne needs water and shade. So that lack of water will cause the cultivation of cayenne to be disrupted. This is in line with Potolau et al. (2014) that cayenne farmers were often faced with erratic weather, which can cause drought, the development of pests and plant diseases so that it can have implications for the uncertainty of the amount of production. If the amount of chili in the market increases, the price will decrease as well as vice versa if the amount of cayenne in the market decreases, the price will rise.In the Distribution criteria, the problem that has the highest weight is the inefficient distribution channel, while the flow of information and transportation smoothly has the lowest weight. This can be seen in Figure 5.

Inefficient cayenne distribution channels in Gorontalo because they have considerable market efficiency values ranging from 9 to 15%. The cayenne distribution channel which has a large marketing efficiency value because it has a long marketing channel, high marketing costs, large marketing margins and involves many marketing institutions such as large traders and out-of-town traders in the process of distributing cayenne pepper. Large marketing costs are due to
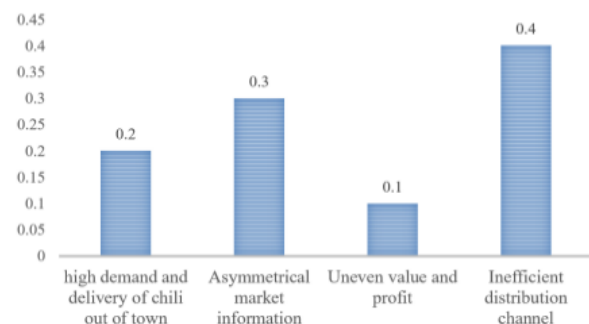


**Fig. 4. Value of problems in supply chain supply for raw chili**



**Fig. 5. Problem value in distribution of raw chili supply chain**

high transportation costs for shipping cayenne out of town. The long distribution channel also caused a lack of market integration due to its implementation.The determination of the selling price of cayenne was only determined by several marketing agencies. This lack of market integration shows the lack of smooth flow of information and communication. Information flows do not run smoothly and balanced (asymmetric), causing farmers not to know the information faced by large traders, so farmers cannot determine the bargaining position in price formation. In addition, Gorontalo cayenne is in demand by consumers from outside the Gorontalo region, causing the delivery of cayenne to outside Gorontalo to be quite high, where shipments mainly to Manado and Bitung are carried out every day. This is related to Kotler (2003), transportation costs had played an extraordinary role in marketing agricultural products. So that in the trading system there might be a disparity in the price of the same agricultural product, as a result of differences in the distance between production centers and sales locations. According to Padjung (2018), in general the supply chain of agricultural commodities in Indonesia was very long and complex, involving many actors, causing high price disparity between farmers and consumers.

The results of the AHP analysis on the price criteria which have the highest value are the problems of the price of cayenne pepper, while the low market integration and the determination of the price of cayenne by wholesalers and outside cities have the lowest value. This can be seen in Figure 6.

The fluctuation in the price of cayenne in Gorontalo is a major problem in the commodity of cayenne. From the results of the study, it can be seen that the price of cayenne dropped during the harvest and the price of cayenne will soar when the availability of cayenne is relatively small. In 2016, the lowest price of cayenne both at the farmer and retailer
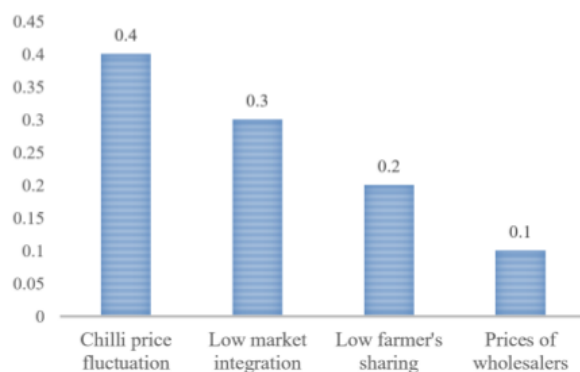


**Fig. 6. Value of problems on the criteria for the price of raw chili supply chain development**

level was in July between $ US 0.55/kg and $ US 1.31/kg, respectively. While the price of cayenne is the highest both at the farmer and retailer level in January between $ US 2.89/kg and $ US 3.79/kg respectively. This is due to the harvest in March-April so that the supply of chili is abundant until July, causing the price of cayenne to drop. In addition, the highest price in January because new farmers planted in October-November causing the supply of thinned chili peppers to cause prices to rise, even though November-December farmers harvested but the harvest in the planting season was small so the yields were small. This is in line with Farid & Subekti (2012), with the pattern of the planting season like that, the potential increase in chili prices occurred at the end and beginning of the year, while the price decline occurred in the middle of the year due to factors during the harvest period.

In addition, the price of cayenne in Gorontalo was very fluctuating from $ US 0.68 to 6.20 per kg. This happened in a matter of days, sometimes the price of cayenne pepper in the morning was sold at $ US 2.41/kg, but in the afternoon it had dropped to $ US 1.38/kg. Actually the production of Gorontalo cayenne is sufficient for the needs of the people of Gorontalo, but due to the delivery of cayenne to outside Gorontalo, the price of cayenne in Gorontalo is determined by large traders and wholesalers outside the Gorontalo area, especially Manado. This causes the price of chili in Gorontalo to follow prices outside the Gorontalo region. In addition, the profits margins have been taken by traders are quite large. This is related to Farid & Subekti (2012) stated that many parties involved in the chain of trading the pricing power at the level of the Bandar which was in the wholesale market (terminal agribusiness). One of the factors causing Bandar to have the power to influence prices was large capital ownership to get a large supply of chili.On the risk criteria, the problem is no contract system that is the top priority because it has the highest value, while payments are always late which have the lowest value. This can be seen in Figure 7.

In the cayenne supply chain, especially shipping out of town, the cayenne payment transaction process only relies on a system of trust between large traders in Gorontalo and outside Gorontalo. There is no system of agreements or contracts between. Payments are usually made within a week with transfers of 2 to 3 times but often large traders in Gorontalo do not receive payments at all to cause losses. Therefore, partnerships between traders and out-of-town traders, especially Manado, do not last long, at most a year, because their partners are deceiving and traders change with others. This causes the cayenne marketing system to have a high risk. Even so, there are still many traders of cayenne because the profits are multiplied by hundreds of millions
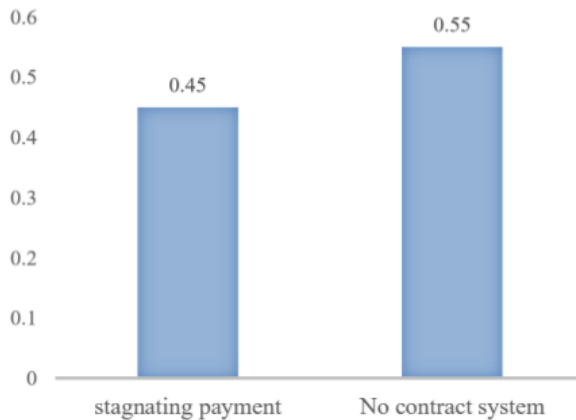
**Fig. 7. Value of problems in the risks of raw chili supply chain development**

of rupiah. This is related to Fajar (2014) opinion stated that the distribution system of cayenne in the supply chain which was built for years so that the current distribution is created, where each member of the supply chain has their own risk in the cayenne supply business process.

**Recommendation for Chili Pepper Supply Chain Development Policy**

The results of the AHP analysis showed the policy recommendations for developing cayenne supply chains in Gorontalo having the highest value and are the first priority is the policy of determining government purchase prices for cayenne pepper, while the policy of supporting secondary

supply chain cayenne has the lowest value. This can be seen in Table 1.

Price policy is a government policy in the economy to influence the operation of the market mechanism, which aims to control market balance (Sukirno, 2002). The government's purchasing policy is the selling price of cayenne pepper at the farm level and retailers to protect producers and consumers. The policy recommendation for determining government purchase prices is a top priority because of the problems faced in developing the supply chain of cayenne in Gorontalo regarding prices. The price of cayenne in Gorontalo has always fluctuated following the market mechanism, especially markets outside Gorontalo.

The Government through the Minister of Trade issued a regulation that containing the stipulation of seven food commodities such as rice, soybean corn, sugar, shallots, chili and beef. The establishment of seven food commodities was stated in rules of trade ministry No.63/MENDAG/ PER/09/2016 concerning the purchase reference price at farmers and the reference sales price at consumers. This Reference price will be valid for 4 months and evaluated according to developing conditions. In this Minister of Trade Regulation, the reference price for purchasing red cayenne pepper in farmers was $ US 1.17 and the reference price for consumer sales was $ US 2.0. However, the government regulation has not been well-socialized, because cayenne continues to follow the prices in the market, where the price of cayenne at the farm level is $ US 1.37 and at the consumer level $ US 2.75. Prices still fluctuate, sometimes falling below the reference price or rising above the reference price. So that the rule of trade ministry needs to be implemented not only for 4 months, but

**Table 1. Recommended value and priorities for the raw chili supply chain development policy in Gorontalo Province, 2018**

| No. | Factors | Recommendation Policy | Value | Priority |
|---|---|---|---|---|
| 1. | Cultivation | Intensification | 0.064 | 5 |
| | | Technical guidance and intensive counseling to farmers | 0.053 | 7 |
| | | Setting planting time | 0.047 | 12 |
| 2. | Stock | Extensification | 0.049 | 11 |
| | | Planting cayenne all year long | 0.06 | 6 |
| | | Product diversification | 0.052 | 8 |
| 3. | Price | Revitalization of agribusiness sub terminals | 0.09 | 3 |
| | | Market operation | 0.09 | 4 |
| | | Government purchase pricing Policy | 0.22 | 1 |
| | | Use of price information | 0.02 | 16 |
| 4. | Distribution | Restrictions on shipping chilies out of town | 0.051 | 10 |
| | | Marketing and partnership information systems | 0.023 | 15 |
| | | Hold training for traders | 0.023 | 14 |
| | | Providing business credit to traders | 0.026 | 13 |
| 5. | Risks | Make a system of agreements/ contracts | 0.095 | 2 |
| | | Reliable and sustainable development of partnership institutions | 0.052 | 9 |

so on and it needs to be carried out to the farmers and traders of cayenne so that farmers and other supply chain actors know about it and can implement it. Fluctuations in the price of cayenne will result in inflation. This is accordance with Rusmadi (2017) opinion stated that red chili contributed greatly to inflation in Indonesia. The main factor that caused the price of chilies to soar was due to extreme weather and unpredictability causing the impact was very influential on farmers. The increase in chili prices was influenced by other factors such as: the expectation of basic needs, transportation costs increase, high bank interest, the existence of extortion, the capital of farmers is limited, and the number of plants affected by pests.

## Conclusion

The price factor has the highest value and the first priority because the price of cayenne is very fluctuating following market mechanisms, especially markets outside the city. This is due to the high demand for fresh chili peppers and the price of cayenne which always follows price increase outside the region despite a surplus production. So, the policy recommendation for developing the cayenne supply chain has the highest value and the first priority is the policy of determining the government's purchase price. The policy of determining government purchase prices is the selling price of cayenne pepper at the level of farmers and retailers to protect producers and consumers.

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